Degradation Behavior of $LaNi_{4.8}Sn_{0.2}H_x$ during Thermal Cycling

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The intrinsic disproportionation behavior of $LaNi_{4.8}Sn_{0.2}H_x$ was determined during extended cycling between 300 K and 535 K. A nearly 80% loss in hydrogen storage capacity was found after 3500 cycles. A partial recovery of capacity was observed following vacuum anneals at T > 570 K. These results are attributed to phase separation into the binary LaH_x phase and Ni metal followed by reformation of the alloy during the anneals. The impact of maximum cycling temperature (T_{max}) on the rate of degradation has been examined from current and previous studies on $LaNi_{4.8}Sn_{0.2}H_x$, $LaNi_{4.7}Al_{0.3}H_x$, and $LaNi_{5.0}H_x$. It is concluded that hydrogen enhances mobility of the metal atoms to produce a thermally activated degradation process and that Sn substitution increases the activation energy for this motion. Thus, a decreased rate of disproportionat ion is observed for $LaNi_{4.8}Sn_{0.2}H_x$.

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